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THE HUMAN SIDE OF LEAN LOGISTICS¹⁾

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ABSTRACT

Logistics is a highly competitive industry, hence logistic service providers (LSP) generally tend to get small margins on their activities. This promotes a managerial tendency to see labor as a source of costs that needs to be disciplined and controlled, rather than a source of added value that needs to be fostered. As a consequence, work pressure is high and the motivating potential of jobs may suffer. In this paper we contend that the concept of "creative tension" (Womack, Jones, & Roos, 1990) taken from the lean production (LP) philosophy may provide for the LSP a way to reconcile the need for added value and the need for cost control. Lean jobs not only require workers to continuously reduce waste in the work environment, but they also bestow on them certain responsibilities to create value. Their contributions to Kaizen support a company's lean journey. In this paper we show that lean can overcome the misfit between worker expectations and job characteristics which will enhance employees' personal outcomes. The fit between job characteristics and workers' expectations and preferences was investigated using Hackman & Oldham's job characteristics model (JCM; Hackman & Oldham, 1976). A survey to measure the variables from the JCM was administered to a sample of 32 employees from a Dutch LSP. The most important result indicated that the extent to which the level of creativity desired by workers fitted the level of creativity required by their jobs was a strong predictor of psychological states (e.g. meaningfulness) and outcomes (e.g. turnover intent). Given the possibilities offered by the concept of creative tension, we argue that the lean philosophy provides the tools to promote the human side of logistics.

INTRODUCTION

Logistic service providers (LSP) generally tend to get small margins on their activities. When market conditions do not allow for an increase in revenues, a strong focus on cost reduction prevails (Johnson, et al., 1999). Since the cost of labor is the major component of logistics costs, an excessive emphasis on cost reduction induces management to see labor as a source of costs that needs to be disciplined and controlled, rather than a source of added value that needs to be fostered and promoted. As a consequence, work pressure is high and the motivating potential of jobs may suffer. Thus, we signal a managerial dilemma. In this paper we contend that the concept of "creative tension" (Womack, et al., 1990) in the lean production (LP) philosophy may provide a way to cope with this dilemma.

One of the consequences of excessive cost control may be a decrease of service level. For logistic service providers, a way to maintain or even improve their service level is to adopt an image of workers, as a source of added value, rather than of costs, a shift reminiscent of McGregor's theory X, saying that the average worker has an inherent dislike of work, prefers to avoid responsibility, and needs to be directed and controlled, to theory Y saying that the ordinary worker does not inherently dislike work, will exercise self-direction and self-control, and learns to not only accept but also seek responsibility (McGregor, 1960). In LP both perspectives merge into the need for creative tension, saying that waste reduction requires strict process control that can only be accomplished through the creativity of the people involved. Although workers may fit, at least to some extent, both categories, jobs need to be designed such, that they fit both managerial and workers' expectations about it. The fit between job characteristics and workers' expectations and preferences was investigated using Hackman & Oldham's job characteristics model (Hackman & Oldham, 1976).

The purpose of this paper is to show that lean can overcome the misfit between worker expectations and job characteristics which will enhance employees' personal outcomes. The paper is organized in the following sections. First we describe logistics service providers and the position

of their employees. Next we turn to lean management and the role of employees in it. We present the results of a survey among employees of a Dutch LSP on how they perceive their jobs and situation, and finally we show how lean practices can contribute to create a fit between company requirements, job characteristics, and worker demands.

LOGISTICS SERVICE PROVIDERS

LSPs can play different roles on behalf of their shippers in a supply chain. Here the emphasis will be on integrated processes, hence on 3PLs, whereas hierarchical levels, hence 4PL will be neglected, for reasons of space and scope. Next the position of employees in LSPs will be analyzed.

The role of logistics service providers

Logistics creates value by bridging gaps in time, place, and quantity by means of storing, transport and handling. Storing bridges the gap in time between production, either for seasonal or for technological reasons, and consumption, enabling availability of the product at the right time, i.e. when needed. It implies seeing that the goods are kept in a proper way both in quantity and quality. Transportation bridges the gap between the location of production and that of consumption, enabling the availability of the product at the right place, i.e. where it is needed. Finally, inbound and outbound processes bridge the gap in quantity in which the products are produced (or arrive at a warehouse) and in which they are needed by the shipper. Inbound consists of receiving, unloading, and checking goods and internal transportation to storage. Outbound processes consist of picking, packing and shipping the goods. In practice the sub processes are organized in sequence, supported by an accompanying information flow at the (random) request of the shipper (Gu et al., 2007).

LSPs perform logistics activities on behalf of shipping firms (Stefansson, 2006). The range of activities as well as the extent of clustering of activities sourced out may differ contract by contract. The activities can consist of different operational, shop floor activities, of activities of different hierarchical levels, as well as to extent of clustering, i.e. consisting of one or more orders. The simplest form of logistics service outsourcing is the operation of transporting or storing goods in one single and isolated order. Expansions hereof can follow the three criteria one-by-one or in combination. Firstly, the operational activities of one function can be clustered, clustered operational activities of different functions can be integrated, and finally, hierarchical expansion can be introduced as well: in addition to operations direct supervision can be outsourced as well and after that the tactical, policy and strategic decisions that govern the logistics activities.

The shipper buys from its suppliers and sells to its shippers and the LSP carries out some of the processes within the framework of the shippers' buyer-supplier relationships and the outsourcing contract. Consequently, LSPs may be faced with the consequences of last minute crises at the shipper and LSPs represent the shipper in their contacts with its suppliers and its shippers. Any mistake made by the LSP is a mistake made by the shipper in the eye of the buyer. Consequently, LSPs have to provide their service at a high level.

Despite the fact that logistics is a core process, shippers are able to negotiate a low price. In essence this is because LSPs are 'captive suppliers' (Bensaou, 1999) as they have to invest substantially to adapt to their customer. The shipper will and need not adapt as the choice of LSPs is abundant and logistics is perceived as just costs and hence is undervalued.

To summarize, LSPs carry out shippers' primary processes at a high service level, but at the lowest price possible. Consequently, LSPs can't make a trade off between low cost and flexible service but have to pursue both simultaneously to satisfy and retain their clients.

The emphasis on costs in decision making on outsourcing by customers as well as LSPs forces the latter to be highly cost conscious. In the cost structure labor costs are dominant. In the Netherlands hourly wages for people employed by LSPs are lower than those for comparable jobs, as table 1 shows.

Type of employee	Average hourly wage
Operator in manufacturing and process industry	21
Trucker	15
Forklift truck driver	13
Warehouse operator	11

Table 1 Hourly wages in LSPs and industry (Hagoort and Van der Linden 2007)

These differences in labor costs enable LSPs to outperform internal logistics departments even if they would be less efficient. However, low labor costs at the outsourcee cause risks for the outsourcer as Jiang et al. (2009) show. Labor problems can result in operational risks such as: poor quality, low productivity, unfulfilled orders and, high turnover. The latter is associated with organizational friction, instability of skills and damaged customer service. This risk also applies in case of LSPs. Finally, reputational risks for the shipper may occur.

The relationship between employees and logistics service providers

Autry and Daugherty (2003) mention that turn over rates in LSPs are very high not only for truckers but also for warehouseers. 20% and more of new hires will leave their job within one year whereas replacing each of them costs thousands of dollars. Their literature review showed that logistics researchers only recently began to focus on employee behaviours and attitudes, with an emphasis on truckers. Most research concentrated on employee turnover and only a few addressed recruitment or incentive plans. Autry and Daugherty (2003) studied the relationship between person-organization fit, satisfaction and coping, building on only two papers on each of the latter two concepts. Employees of LSPs who have realistic expectations about their company and supervisor characteristics are more likely to be satisfied with their employment. More satisfied employees exhibit behavior that benefits themselves and or the company whereas dissatisfied employees try to leave the company or behave counterproductively. Consequently, person organization fit is positive for both the employee and the company.

Min (2007) examined sources of warehouse employee turnover, categorized in three variables: occupational (e.g. skills), organizational (e.g. size), and individual (e.g. job security). He found that job security was one of the most important factors for retaining employees, whereas monetary incentives hardly influenced turnover. However, the larger the company, the higher the turnover was because of lack of personal attention. More experienced employees were less inclined to give up their current jobs probably because of a proper fit. Ellinger et al. (2008) studied employee level and organizational performance in LSPs and discuss three options to align staff and organization: service-related training, coaching and empowerment. Empowerment does not support the organization or the employee performance; training supported employee performance but not organizational performance and finally coaching supports both types of performance. Hackman and Oldham (1976) present a general Job Characteristics Model which integrates employee demands, job characteristics (person-organization fit), psychological states and outcomes (cfr. Min) (see Figure 1). Certain options exist to align these three aspects (Ellinger et al.)

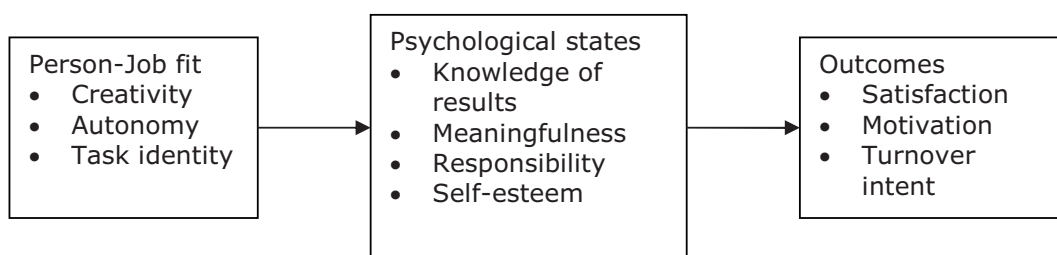


Figure 1 Research model, adapted from Hackman & Oldham (1976).

LEAN MANAGEMENT

Principles

The lean philosophy can be summarized as: produce twice as much with only half of the inputs (Womack et al., 1990). Although various lists of principles to characterize lean are found, they show quite some resemblance. In essence it is about three principles: create value, reduce waste and improve continuously.

Its starting point is to create customer value by producing only what is needed and when it is needed. This ultimately leads to uninterrupted flows of products through the various stages of production.

Such flows require 100% process control and zero waste (e.g. inventory or defects) causing perfect processes. Harrison and Van Hoek (2008) present a pyramid of key factors that underpin uninterrupted flows, without any waste whatsoever.

The final key principle is continuous improvement, as lean is 'a journey' rather than a pre-set recipe. When gaining more experience with a process, ideas for improvement will pop up, using input from those who actually work in these processes. The continuous improvement causes increased perfection in performance as reflected in a learning curve.

Practices

Over time dozens and dozens of lean tools and techniques have emerged as a result of the continuous improvement approach. Some of them are more popular than others in the literature as well as in practice. Shah and Ward (2003) clustered these tools and techniques into four bundles: Just-in-time (JIT), Human resource management (HRM), Total productive maintenance (TPM) and Total quality management (TQM). The first deals with the content of the firms' primary processes, whereas the latter three provide conditions to facilitate JIT. JIT is about the continuous, uninterrupted production flow with a constant and balanced use of the available resources. Flows are pulled by a customer order and produce the right item at the right time and in the right quantity. Preferably it is about batch size one, based on minimal set up times and proper scheduling. For employees these uninterrupted and balanced flows imply the discipline and tension of standardized operating procedures (cfr. Womack et al., 1990). However, when a product that has to be processed enters a workstation the employee will check it. If a mistake is detected either by equipment or by an employee it has to be corrected immediately. The employee can stop the production flow autonomously to do so. HRM ensures that staff is trained properly both to produce as needed and to improve processes when needed. In the end the 100% -controlled processes facilitate meeting all performance criteria simultaneously. TPM supports the availability of the needed physical equipment and its proper functioning to facilitate the production flow. TQM enables quality throughout the system as well as process improvements to meet the ideal of zero defects. In case of structural problems, employees will form a kaizen group to analyze and solve the problem. The in-process quality checks and the participation in kaizen groups add the 'creative' to Womack et al.'s creative tension. In literature (e.g. De Treville and Antoniakis, 2006) the emphasis is on the tension aspect of lean jobs as the creative aspect is neglected.

RESULTS

Building on Hackman and Oldham's (1976) well-known job characteristics model (JCM), we hypothesized that a fit between core dimensions of an employee's growth need and the growth potential offered through the corresponding dimensions of the job would affect the worker's psychological state, which would in turn influence outcomes. As core dimensions we measured the need for vs. the potential for autonomy and creativity in the job, and task identity. As psychological states we measured meaningfulness of the work, responsibility, knowledge of the results, and organization-based self-esteem (Pierce, Gardner, Cummings, & Dunham, 1989), and the outcomes measured were job satisfaction, motivation, and turnover intent. In addition we propose that lean management can solve misfits that may be discovered.

Participants in our study were 32 employees from a Dutch LSP. All of them were men, their mean age was 30.7 years ($SD = 12.4$) and their mean tenure was 8.5 years ($SD = 8.4$). They were administered a pencil and paper survey and they were allowed to answer the questions during work time. All constructs were measured reliably, with Cronbach's alphas of .70 and up, based upon a 1-7 scale. To determine the misfit between the worker and the job, we calculated difference scores for the autonomy (DifAut), creativity (DifCrea), and task identity (DifID) desired by the worker and offered by the job. The descriptive statistics for the variables in the model are presented in Table 2:

	Variable	M	SD
Person-Job misfit	DifCrea	1.19	1.01
	DifAut	-.01	1.38
	DifID	.46	1.17
Psychological state	Knowledge of results	5.09	2.00
	Meaningfulness	5.96	1.44
	Responsibility	6.06	1.65
	Self-esteem	4.83	1.37
Outcome	Satisfaction	5.71	1.25
	Motivation	5.98	.80
	Turnover intent	2.63	1.64

Table 2 Descriptive statistics

Table 2 shows some interesting results. The creativity dimension shows the largest gap between what workers want and get from their jobs, whereas in terms of autonomy they make a good fit on average, but the standard deviation indicates relatively large individual differences. As regards the psychological states and outcomes, the results are quite encouraging for the employing organization, but the large standard deviation for knowledge of results shows that not all are aware of the fruits of their efforts.

The relationships can be summarized as follows (all correlations significant at the $p < .05$ level).

First, both age ($r = -.51$) and tenure ($r = -.48$) are significantly related to DifCrea. In other words, younger workers and those with shorter tenure perceive more difference between what they want and what they get from their job in terms of creativity. Contrary to tenure, age also predicts responsibility ($r = .39$) and turnover intent ($r = -.33$).

Second, DifID does not predict either of the psychological states and the outcomes.

Third, DifCrea predicts the psychological states self-esteem ($r = -.40$), meaningfulness ($r = -.45$) and responsibility ($r = -.40$) and the outcomes satisfaction ($r = -.30$) and turnover intent ($r = .33$).

Fourth, DifAut only predicts the psychological states self-esteem ($r = -.42$), meaningfulness ($r = -.31$) and knowledge of results ($r = -.29$), but no outcomes. It is important to note that DifAut and DifCrea constitute distinct dimensions as they are not significantly related.

Fifth, the relationship between DifCrea and turnover intent is partially mediated by self-esteem (R^2 for total model = .21).

DISCUSSION

The key argument in this paper is that, to stay competitive, LSPs are required to increase their service level while decreasing their costs. We have argued that the lean manufacturing philosophy may provide a way to simultaneously meet both requirements, and the concept of creative tension, which has been neglected in research thus far, offers a promising perspective to do so. The tension aspect relates to the fact that workers are required to apply standard operating procedures with limited takt times to ensure an uninterrupted production flow, and the creative aspect relates to the fact that basically it is the workers' insight and creativity that helps to identify sources of waste

and ways to deal with it, thereby making the processes go ever smoother. We have argued that lean can be expected to affect work in general and job characteristics in particular. In prior research, de Treville and Antonakis (2006) have raised the intriguing question whether lean job design can be reconciled with motivation. We have investigated this question in the theoretical perspective of the JCM.

Our most important finding is that, depending upon age and tenure, to the extent that the creativity offered in the job meets the creativity required by the worker, positive effects in terms of high self-esteem, experienced meaningfulness and responsibility, and high satisfaction and low turnover intent may be expected, whereas, contrary to expectations, a fit in task identity does not. A misfit with respect to autonomy also affected psychological states. This adds to Autry and Daugherty's findings (2003) with respect to person-organization fit, as well to Min's (2007) findings with respect to the relationship between psychological states. Hackman and Oldham's model provides a nuanced picture of how employees react to their jobs, also in LSPs. Management of LSPs should try and balance job design with both the requirements of the primary processes as well as with the expectations of their employees. Consequently, the LSP involved in this study should improve on implementation of the 'creative' aspects of the jobs to become more attractive as an employer, in particular for younger workers. Coaching (Ellinger et al., 2008) could be directed towards more autonomous behaviour as well as to contributing to solving problems either when performing primary processes or to solve structural problems.

Although the small sample size is an important limitation of our study, the fact that nevertheless the aforementioned relationships were all significant at the $p < .05$ level is an important indication that lean jobs can be intrinsically motivating in LSPs. Lean may provide requirements concerning the worker's growth need which may satisfy important needs and produce positive outcomes. This is an important finding, worthy of future research into two directions. On the one hand this research should be replicated on a larger scale, but on the other the general direction of 'autonomy' and 'problem solving' should be specified. The latter requires LSPs to undertake the lean journey and discover what the human side of lean logistics looks like in their firm.

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